Package 'gfilinreg'

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Type Package

Title Generalized Fiducial Inference for Low-Dimensional Robust Linear Regression

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Description Fiducial framework for linear regression models allowing normal, Student, Cauchy, or logistic error terms. Only low-dimensional models are possible, such as the simple linear regression model, or the one-way ANOVA model with two factor levels. Reference: Hannig, Lai & Lee (2014) <doi:10.1016/j.csda.2013.03.003>.

License GPL-3

Encoding UTF-8

LazyData true

Depends R (>= 3.1.0)

Imports Rcpp, lazyeval, stats, utils, spatstat.geom, spatstat (>= 2.0-0), EigenR, data.table, parallel, memuse

Suggests heavy, kde1d, knitr, rmarkdown

LinkingTo Rcpp, RcppEigen, BH

RoxygenNote 7.1.1

URL https://github.com/stla/gfilinreg

BugReports https://github.com/stla/gfilinreg/issues

VignetteBuilder knitr

NeedsCompilation yes

Repository CRAN

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R topics documented:

`FID` *Fiducial summaries of simulations*

Description

A `data.table` containing the fiducial results of the simulations whose code is given in the vignette.

Usage

```
FID
```

Format

A `data.table` with 1500 rows and 5 columns.

`gfiCDF` *Fiducial cumulative distribution function*

Description

Fiducial cumulative distribution function of a parameter of interest.

Usage

```
gfiCDF(parameter, fidsamples)
```

Arguments

`parameter`	a right-sided formula defining the parameter of interest
`fidsamples`	fiducial samples, the output of `gfilinreg` or `gfilinregPredictive`

Value

The fiducial cumulative distribution function of the parameter.

Examples

```
set.seed(666L)
dat <- data.frame(
  group = gl(2, 5),
  y = c(2*rlogis(5L), 10 + 2*rlogis(5L))
)
gfi <- gfilinreg(
  y ~ 0 + group, distr = "logistic", data = dat, L = 25L, nthreads = 2L
)
fcdf <- gfiCDF(~ group1 - group2, gfi)
fcdf(0)
plot(fcdf)
```

`gfiConfInt` *Fiducial confidence interval*

Description

Fiducial confidence interval of a parameter of interest.

Usage

```
gfiConfInt(parameter, fidsamples, conf = 0.95)
```

Arguments

`parameter`	a right-sided formula defining the parameter of interest
`fidsamples`	fiducial samples, the output of `gfilinreg` or `gfilinregPredictive`
`conf`	confidence level

Value

The fiducial confidence interval of the parameter.

Examples

```
set.seed(666L)
dat <- data.frame(
  group = gl(2, 15),
  y = c(2*rlogis(15L), 10 + 2*rlogis(15L))
)
gfi <- gfilinreg(
  y ~ 0 + group, distr = "logistic", data = dat, L = 30L, nthreads = 2L
)
gfiConfInt(~ group1 - group2, gfi)
```

`gfilinreg` *Fiducial sampler for linear regression model*

Description

Weighted samples of the fiducial distribution of the parameters of a linear regression model with normal, Student, Cauchy, or logistic error terms.

Usage

```
gfilinreg(
  formula,
  data = NULL,
  distr = "student",
  df = Inf,
  L = 30L,
  Kmax = 50L,
  nthreads = parallel::detectCores(),
  stopifbig = TRUE
)
```

Arguments

`formula`	two-sided formula defining the model
`data`	dataframe containing the data
`distr`	the distribution of the error terms, `"normal"`, `"student"`, `"cauchy"`, or `"logistic"`
`df`	degrees of freedom of the Student distribution if `distr = "student"`
`L`	number of subdivisions of each axis of the hypercube `(0,1)^(p+1)`
`Kmax`	maximal number of combinations of indices to use
`nthreads`	number of threads for parallel computations
`stopifbig`	logical, whether to stop if the algorithm requires huge matrices

Value

A `gfilinreg` object, list with the fiducial samples and the weights.

References

Jan Hannig, Randy C.S. Lai, Thomas C.M. Lee. *Computational issues of generalized fiducial inference*. Computational Statistics and Data Analysis 71 (2014), 849–858. <doi:10.1016/j.csda.2013.03.003>

Examples

```
set.seed(666L)
x <- c(1, 2, 3, 4)
y <- x + 3 * rcauchy(4L)
gfi <- gfilinreg(y ~ x, distr = "cauchy", L = 30L, nthreads = 2L)
gfiSummary(gfi)
```

`gfilinregPredictive` *Fiducial predictive distribution*

Description

Simulations of the fiducial predictive distribution.

Usage

```
gfilinregPredictive(fidsamples, newdata)
```

Arguments

`fidsamples`	fiducial samples, the output of `gfilinreg`
`newdata`	dataframe in which to look for variables with which to predict, or `NULL` if the model is intercept-only

Value

A list with two fields: `FPD`, a dataframe containing the simulations, and `weight`, their weight. This is a `gfilinreg` object.

Examples

```
set.seed(666L)
x <- c(1, 2, 3, 4)
y <- x + 3 * rcauchy(4L)
gf <- gfilinreg(y ~ x, distr = "cauchy", L = 30L, nthreads = 2L)
gfpred <- gfilinregPredictive(gf, data.frame(x = c(4, 5)))
gfiSummary(gfpred)
```

gfiQuantile *Fiducial quantiles*

Description

Quantiles of the fiducial distribution of a parameter of interest.

Usage

```
gfiQuantile(parameter, fidsamples, probs)
```

Arguments

parameter	a right-sided formula defining the parameter of interest
fidsamples	fiducial samples, the output of gfilinreg or gfilinregPredictive
probs	numeric vector of probabilities

Value

Numeric vector of quantiles, of the same length as probs.

Examples

```
set.seed(666L)
dat <- data.frame(
  group = gl(2, 15),
  y = c(2*rlogis(15L), 10 + 2*rlogis(15L))
)
gfi <- gfilinreg(
  y ~ 0 + group, distr = "logistic", data = dat, L = 30L, nthreads = 2L
)
gfiQuantile(~ group1 - group2, gfi, c(25, 50, 75)/100)
```

gfiSummary *Summary of fiducial samples*

Description

Summary of the fiducial samples.

Usage

```
gfiSummary(fidsamples, conf = 0.95)
```

Arguments

`fidsamples`	fiducial samples, the output of `gfilinreg` or `gfilinregPredictive`
`conf`	confidence level

Value

A matrix with summary statistics: means, medians, and confidence intervals.

Examples

```
set.seed(666L)
dat <- data.frame(
  group = gl(2, 15),
  y = c(2*rlogis(15L), 10 + 2*rlogis(15L))
)
gfi <- gfilinreg(
  y ~ 0 + group, distr = "logistic", data = dat, L = 30L, nthreads = 2L
)
gfiSummary(gfi)
```

MAXLHD *Maximum likelihood estimates of simulations*

Description

A matrix containing the maximum likelihood estimates of the simulations whose code is given in the vignette.

Usage

```
MAXLHD
```

Format

A `matrix` with 500 rows and 3 columns.

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